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The essential parts as shown here are the squared house-post (*a*), into the side of which is set, by means of a notch (of the type shown in fig. 4, *b*) a stringer (pl. XIII, *b*) running lengthwise of the house. Upon this rest the bamboo poles (*c*) which support the palm-

a *b*

FIG. 2.—Details of frame construction

wood floor (*d*). This floor is at a height of eight feet nine inches from the ground, into which the house-posts are set to a depth of three or four feet. The house-post projects seven feet above the floor level, and at its top is cut another notch (of the type shown in fig. 4, *a*, and 5,) into which is bound another long stringer,

a *b*

FIG. 3.—Details of frame construction

c, similar to *b*, and which forms the support for the entire superstructure. A corner of such a superstructure is shown in fig. 5, in which the parts are lettered to correspond with those shown in pl. XIII. In fig. 5 the point of observation is within the house. The longitu-

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dinal stringer (*e*) projects three or four feet beyond the house-post, and upon this rests the transverse stringer (*f*) which projects about the same distance beyond

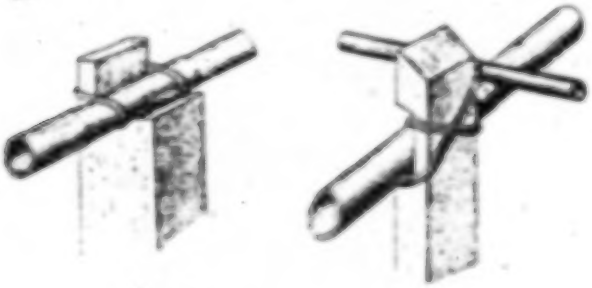

FIG. 4.—Notches for receiving stringers

the former (*e*). Near the end of this projection rests another longitudinal stringer (*g*), upon which rest the lower ends of the rafters forming the side of the roof. In some structures the ends of the rafters of the gable

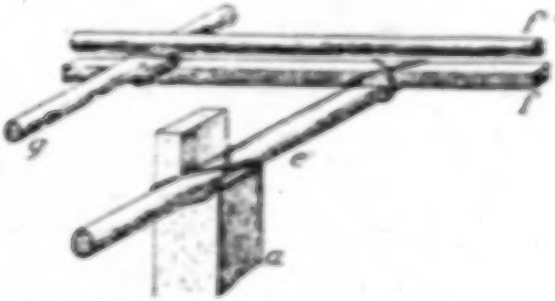

FIG. 5.—Corner of superstructure seen from interior

rest directly upon *f*, as is the case in the large house above mentioned, an elevation of which is illustrated in pl. XIII and also in the unfinished structure shown

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in pl. VII. In some other dwellings another transverse beam (fig. 5, *f'*) is used as the support for the gable rafters.

In practically all cases in which two such stringers cross or where a stringer passes through a notch in a post, the parts of such a joint are securely bound together by one or another of the several methods shown in figs. 2-4. The binding material is a durable aerial root, called pitigua in the local Spanish, which is gathered and kept on hand for this purpose and for making certain kinds of basketry. It is kept in coils such as that shown in pl. XCI, 4, and when dry it needs only to be soaked for a short time to render it pliable.

The roof frame of such a building consists of a short central ridge-pole (pl. XIV, *i*), supported by two and in some cases three stout vertical bamboos (*m*) which in turn rest upon a horizontal beam (*j*) running lengthwise through the center of the building. The ridge-pole is of such length as to give the gable roofs a pitch of about forty-five degrees. It varies, therefore, according to the proportionate dimensions of the structure, but is usually from a third to a half as long as the building itself. The bamboos supporting the ridge-pole are, in the case of the large dwelling above mentioned, 13 feet 9 inches in height. The bamboo rafters of the sides of the roof rest directly upon and are bound to this ridge-pole. Those forming each gable are fastened together by means of a palm-wood rod passing through holes near the small upper ends of the rafters. This rod is bound to the two end-rafters of the sides of the

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roof, usually at a point two or three feet down from the ridge-pole. The other ends of these gable rafters are spread fan-like along the end beam (fig. 5, *f*, *f'*) of the superstructure so as to produce a complete frame for the attachment of the thatch of the gable. There is thus left at the top of this gable a small triangular opening, such as that shown in pl. x, which serves as a vent for the smoke from the open fire-box. The thatch is so laid on that it projects about two feet beyond the ends of the side roofs, while the thatch on the gable end just meets the underside of this projection. The projection of the ends of the side roofs in this manner prevents the rain from driving through the thatch along the line upon which the side and gable roofs meet, and it is also sufficient to prevent the entrance of rain through the triangular opening at the extreme top of the gable. The slant of the roof, both gable and side, is usually about forty-five degrees. The slant of the gable is regulated by the length of the short ridge-pole above mentioned. This whole construction of the superstructure of such a building is well illustrated in the unfinished dwelling shown in pl. VII.

The covering of the roof is a thatch of palm-leaves, usually those of the tagua, or ivory-nut palm. The necessity for a constant supply of these leaves, combined with the desire to perpetuate the supply of ivory nuts (since these are a source of considerable wealth), has caused the Cayapa to preserve carefully the groves of these palms. Even single palms growing quite apart from others are conserved. The trees, vines, and under-

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cut in the light of the moon is practically worthless. The Indians, however, while they have adopted certain of the negro customs, and while they recognize this one to a limited extent, are usually much more governed by necessity and convenience in the cutting of the thatch or the felling of timber than by the phases of the moon. The bundles, or sets, of four half-leaves are applied directly to the bamboo rafters, the midribs of the leaves being quite sufficient to serve as horizontal supports for the thatch. Beginning at the eaves, the bundles are laid in courses in the same manner as are shingles. The natural underside of the leaf is placed uppermost, and the courses are laid with only about six to eight inches of the tips of the leaflets exposed to the weather. Each bundle is securely bound with pitigua, in from two to four places, to the rafters it crosses. By this overlapping process a thick and watertight roof is secured. The leaflets run directly down the slant of the roof, thus naturally tending to conduct the water from one tier of thatch to the next. Further, as above mentioned, the natural undersides of the leaflets are placed uppermost, and each of these leaflets forms a small shallow trough which readily conducts water. The thatch of the large house above referred to and illustrated (pl. XI) is no less than three inches, and in places probably four inches, in thickness. In this structure the northern gable of the section *a* consists of ten rafters covered with fifty-seven courses of thatch. The sides of this section consist of seventeen rafters covered with sixty courses of thatch.

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224 411 slightly toward its point, the opposite end being provided with a flaring mouth-piece two to three inches in diameter. It is made a follows: The innermost part consists of two pieces of palm-wood, each containing a groove, and forming, when placed together, a perfectly even-bored tube about three-eighths of an inch in diameter and with a wall half to three-quarters of an inch thick. The two halves of this tube are bound firmly together at from three to five points along its length by means of thin, narrow strips of pitigua, or with one of the stout fibers from the base of the leaf of the palma real. This binding is merely to hold the two halves of the tube together while they are being completely wrapped, which is done with strips of pitigua about one-sixteenth of an inch in thickness and one-quarter of an inch in width. It is wrapped tightly and very evenly from end to end in such manner as to completely cover the wood. This spiral wrapping of so long an object [284] requires a great length of these narrow strips. As the end of one strip is reached, the end of the next is inserted in such a manner as to be held firmly in place and to make each strip bind the next. This pitigua wrapping is in turn covered and made waterproof by a coating of brea, or wax, as above mentioned. On some of the blow-guns a hump is made in the brea at a point a short distance in front of the mouth-piece. This serves as a kind of sight by which to take aim, though obviously it is not a very accurate gauge, consequently the aiming is largely a matter of calculation by the hunter, and accuracy is acquired only by long practice. The

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length, requires the labor of ten or a dozen persons. In the case of the large canoe shown in the illustrations three pairs of small holes were cut into its gunwales—one pair near each end and one at the middle—and to these were fastened three green wooden bars about an inch in diameter and projecting six or eight inches on each side of the canoe, thus serving as grips or handles for the haulers. The process of cutting the holes for these cross-bars is shown in pl. LXXI. Such bars must not be bound tightly to the gunwales, but of such looseness that they may be slipped in and out of the lashings, as is often necessary in passing close to a tree. A trail is carefully cut through the jungle, the trunks of small trees being thrown across it at intervals of a foot to four or five feet, in order to keep the canoe above the ground, thus greatly reducing the friction as the craft is moved along.

If the site of the construction of the canoe is at a considerable elevation, it must be let down carefully to the lower level by way of an incline. To accomplish this there are first wedged in at the prow and stern of the canoe two short transverse bars just below the level of the gunwales. From a large tough vine or aerial root, said to come from a plant called in the local Spanish matamba, and in Cayapa bi'ta, are twisted two-ply cables, such as that shown in pl. XCI, 5, and often as much as sixty or seventy feet in length. One of these is tied with a simple knot to each of the transverse bars above mentioned. The forward cable is passed with a half-hitch about the prow of the canoe and is

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bound securely at the point at which the cable crosses itself in making the half-hitch in order to prevent this from slipping off the prow. The one at the stern passes directly over the notch which is always present at each end of the canoe, and is bound to the point of the stern in such manner as to prevent slipping to either side, thus keeping the stress of the cable directly upon the short cross-bar and avoiding the danger of wrenching the bar loose by a sidewise pull. By snubbing with these cables, a large canoe may be lowered with comparative ease down a very steep incline. To accomplish this, a single turn is taken with the rear cable about the trunk of a tree, and by slacking off the canoe is let slowly down until the end of the cable is nearly reached. Meanwhile the forward cable has been passed about a tree and snubbed in the same manner to prevent accident to the rear cable. Having finally neared the end of the rear cable, the forward cable is made fast and the canoe held in position while the rear cable is taken down-hill and passed about a tree near the canoe in the same manner as above described. Then the two cables are paid out again until the end of the forward cable is reached, when the canoe is again halted and the forward cable taken down the hill as was the rear one. Thus, by this process of snubbing with the two cables, the probability of losing control of the heavy craft is eliminated. All this time, of course, the haulers are at the sides of the canoe helping to steady and guide it. One person only is needed to pay out each of the cables. Care is taken in snubbing a canoe down in this manner to see that

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adzed first. The inner sides are adzed first across the grain and then diagonally to it, and finally the bottom is adzed in a similar manner. This work is done with a hand-adz such as that shown in fig. 10. 396

This tool is of modern introduction, as indeed are the canoes themselves, as well as the method of their manu- 412 [177]

[284]●

FIG. 10.—Modern adz used in making canoes

facture. The blade of the adz is of steel and is made by local blacksmiths down the river. The wooden handle, shown in fig. 11, is made by the Cayapa, and is so constructed, with the large projection above and with the notches below, that the blade may be securely bound to it, as is shown in fig. 10, by means of pita-fiber string. The blade is concave, and its edge is usually quite regular and curved, so that, while its full width may be [284]

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easily gathered, since by simply pulling on them they usually break off at or near the plant itself, and often a root seventy-five or even a hundred feet in length is obtained. It is employed not only for basket-making but for many other purposes, such as for binding together the parts of a house-frame (figs. 2–5), for binding the palm-leaf thatch upon the roof (pl. VII), and indeed wherever material for tying or binding is needed. It serves also the many purposes for which civilized people use string and rope, as for mooring canoes, securing animals, etc. Pitigua fiber is practically indestructible so far as dampness is concerned, and may even be kept wet for a considerable time without rotting. If kept from direct contact with water, however, it will last for years even in this humid climate, as is shown by the bindings on the frames of some of the Cayapa houses that have been in use for ten or fifteen years at least.

When gathered these roots are usually made up into large coils (pl. XCI, 4) and laid away in a dry place until needed. To render them pliable they are soaked over night in the river. In two forms of baskets the warp elements are made of the smaller whole roots of the pitigua, otherwise the material is always split into strips or splints, which are prepared as follows:

The bark of the root being first removed, its inner woody portion is split into long, thin ribbons. The individual fibers of the root are extremely long and straight, hence when once started a ribbon can be split the full length of the root with almost perfect evenness. Usually one end of the root is taken up and split with a knife or machete, for a distance of an inch or two, into

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halves. This is done by bending over a section about a foot long at the extreme tip of the bunch of leaves. The

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[284]

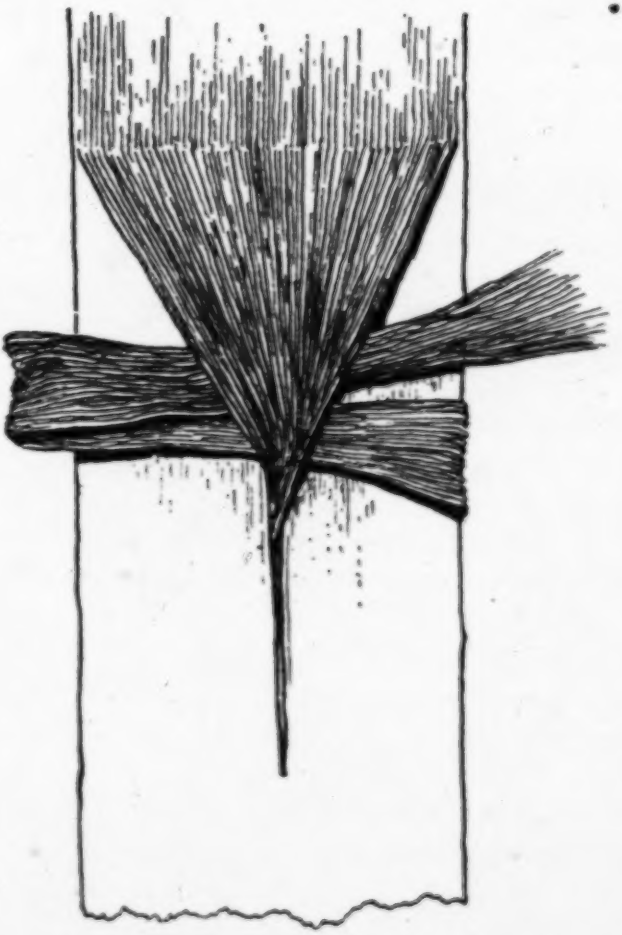

FIG. 25.—Pita fibers tied to prevent tangling

upper halves of the leaves are then scraped as described. Finally each leaf is separately reversed, the scraped por-

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286 which the weaving is done. By weaving now evenly along this line without adding more meshes to the succeeding lines, a rectangular net of the desired length is produced. The final corner of the net is made by dropping knots and meshes in the succeeding rows of weaving: in other words, by exactly reversing the process employed in starting the original corner.

[284]

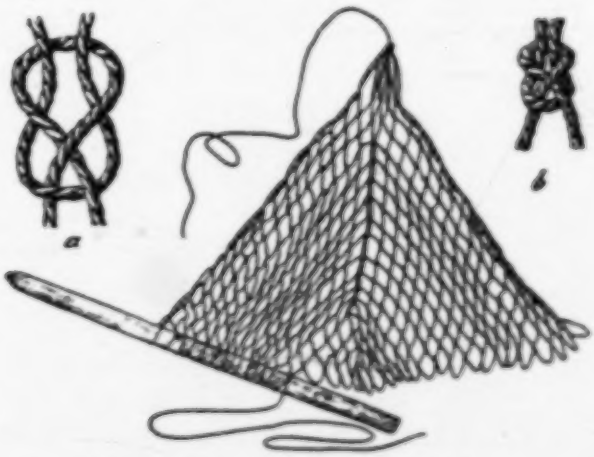

FIG. 27.—Net weaving and detail of knot

All nets are woven with the same type of knot, two details of which are exhibited in fig. 27. In *a* is shown one of these knots opened to a considerable extent, and in *b* this knot is shown as it appears closed and drawn tightly in the net. The use of the mesh-stick is also shown in the figure, which illustrates the beginning of a conical dip-net. The technic of this net differs somewhat from that of the set-net above described, but the knot employed and the use of the mesh-stick are the same.

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untarily for this castigation, but children of from two to five years are usually accompanied. If necessary they are brought forcibly by their elders. The very small children generally receive but a light tap from the castigator.

A few minutes after the castigation at the altar commenced, an assistant took up his position just outside the door of the church and there administered punishment to any who desired it, after which they were at liberty to enter and receive still more at the altar if they desired, although this was not necessary. Pl. CXXXVII presents a view of this castigator with his cat-o'-nine-tails. Pl.

FIG. 28.—Technic of cording on cat-o'-nine-tails

CXXXIX, 2, shows him in the act of striking a devotee. In actual practice this was done at the door of the church. These two pictures, however, were posed at a short distance from the building in order to gain a better light. Fig. 28 shows the technic of cording on the whip.

By 11:30 the castigation of the devotees was finished and the second ofrenda of the day was called. Nearly everyone attended, but a few remained at the "rancho" to play before the saintly images there.

At about 4 P.M. the saints from the "rancho" were re-